



(11)

EP 4 516 134 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
05.03.2025 Bulletin 2025/10

(21) Application number: **23865654.0**

(22) Date of filing: **02.06.2023**

(51) International Patent Classification (IPC):
A24F 40/05 ^(2020.01) **A24F 40/30** ^(2020.01)
A24F 40/10 ^(2020.01) **A24F 40/42** ^(2020.01)
A24F 40/44 ^(2020.01) **A24F 40/50** ^(2020.01)
A24F 40/485 ^(2020.01)

(52) Cooperative Patent Classification (CPC):
A24F 40/05; A24F 40/10; A24F 40/30; A24F 40/42;
A24F 40/44; A24F 40/485; A24F 40/50

(86) International application number:
PCT/KR2023/007661

(87) International publication number:
WO 2024/058350 (21.03.2024 Gazette 2024/12)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **16.09.2022 KR 20220117171**

(71) Applicant: **KT&G Corporation**
Daedeok-gu
Daejeon 34337 (KR)

(72) Inventors:
• **JUNG, Yongmi**
Daejeon 34128 (KR)
• **KIM, Moonwon**
Daejeon 34128 (KR)
• **SHIN, Jun Won**
Daejeon 34128 (KR)

(74) Representative: **Ter Meer Steinmeister & Partner**
Patentanwlte mbB
Nymphenburger Strae 4
80335 Mnchen (DE)

(54) **AEROSOL-GENERATING DEVICE**

(57) An aerosol generating device according to an embodiment includes a supplier including an aerosol forming substrate, a substrate unit configured to atomize the aerosol forming substrate, a surface wave generator configured to transmit a surface acoustic wave that ato-

mizes the aerosol forming substrate to the substrate unit, and an inhaler from which a user inhales the aerosol forming substrate atomized in the substrate unit, in which the supplier is configured to move the aerosol forming substrate to the substrate unit.

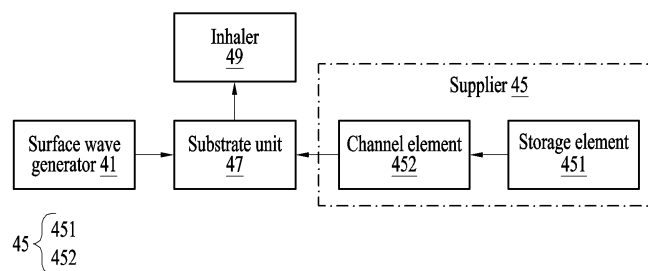


FIG. 2

Description

TECHNICAL FIELD

[0001] The following description relates to an aerosol generating device.

BACKGROUND ART

[0002] Recently, demands for alternatives to overcome the disadvantages of general cigarettes have increased. For example, an inhaler is an instrument used for a user to inhale a composition, such as a drug, as liquid or gas, through the oral or nasal cavity in an inhalation process. Such an inhaler may include a container accommodating an inhalable composition, and the composition may be sprayed from the container through a thin tube to the oral cavity or nasal cavity through an intake to be inhaled by a user.

[0003] As an example of the prior arts, an inhaler is disclosed in European Patent Application No. 0017578 (March 19, 1980).

[0004] The above description is information the inventor(s) acquired during the course of conceiving the present disclosure, or already possessed at the time, and was not necessarily publicly known before the present application was filed.

DISCLOSURE OF THE INVENTION

TECHNICAL GOALS

[0005] An aspect provides an aerosol generating device using a surface acoustic wave.

[0006] Another aspect also provides an aerosol generating device configured to control the atomization of a plurality of aerosol forming substrates.

[0007] Another aspect also provides an aerosol generating device configured to control an atomization amount.

TECHNICAL SOLUTIONS

[0008] According to an aspect, there is provided an aerosol generating device including a supplier including an aerosol forming substrate, a substrate unit configured to atomize the aerosol forming substrate, a surface wave generator configured to transmit a surface acoustic wave that atomizes the aerosol forming substrate to the substrate unit, and an inhaler from which a user inhales the aerosol forming substrate atomized in the substrate unit, in which the supplier is configured to move the aerosol forming substrate to the substrate unit.

[0009] The supplier may include a storage element configured to store the aerosol forming substrate and a channel element connected to the storage element and configured to move the aerosol forming substrate stored in the storage element.

[0010] The aerosol forming substrate may include different types of a plurality of liquids, and the supplier may include a first storage element configured to store a first liquid and a second storage element configured to store a second liquid.

[0011] The channel element may move the aerosol forming substrate through a capillary phenomenon.

[0012] The supplier may include a control element configured to control a rate of flow of the aerosol forming substrate that moves through the channel element.

[0013] The supplier may include a first channel element configured to move the first liquid stored in the first storage element and a second channel element configured to move the second liquid stored in the second storage.

[0014] The supplier may further include a third storage element connected to the first channel element and the second channel element and configured to mix the first liquid with the second liquid and a third channel element configured to move the mixed first liquid and the mixed second liquid from the third storage element to the substrate unit.

[0015] The surface wave generator may include a plurality of surface wave generating elements configured to generate a surface acoustic wave independently of one another.

[0016] The supplier may further include a first control element configured to control a rate of flow of the first liquid that moves and a second control element configured to control a rate of flow of the second liquid that moves.

[0017] The substrate unit may further include a first substrate configured to atomize the first liquid and a second substrate configured to atomize the second liquid and a reactor in which the atomized first liquid and the atomized second liquid react.

[0018] The surface wave generator may include a first surface wave generating element configured to transmit a surface acoustic wave to the first substrate and a second surface wave generating element configured to transmit a surface acoustic wave to the second substrate.

[0019] The surface wave generator may include a first surface wave generating element configured to transmit a surface acoustic wave to the substrate unit and a second surface wave generating element configured to transmit a surface acoustic wave to the third storage element.

[0020] The channel element may include a porous structure.

EFFECTS OF THE INVENTION

[0021] According to an aspect, an aerosol generating device may generate an aerosol by using a surface acoustic wave.

[0022] According to another aspect, an aerosol generating device may control the atomization of a plurality of aerosol forming substrates.

[0023] According to another aspect, an aerosol generating device may control an atomization amount.

BRIEF DESCRIPTION OF DRAWINGS

[0024]

FIG. 1 is a block diagram illustrating an aerosol generating device according to an embodiment.

FIG. 2 is a block diagram illustrating the aerosol generating device according to an embodiment, including a channel element and a storage element.

FIG. 3 is a diagram illustrating the aerosol generating device according to an embodiment, including a plurality of storage elements.

FIG. 4 is a diagram illustrating the aerosol generating device according to an embodiment, including a plurality of channel elements.

FIGS. 5A and 5B are diagrams each illustrating the aerosol generating device according to an embodiment, including an additional storage element and an additional channel element.

FIGS. 6A and 6B are diagrams each illustrating the aerosol generating device according to an embodiment, including a control element.

FIG. 7 is a diagram illustrating the aerosol generating device according to an embodiment, including a reactor.

FIGS. 8 to 10 are diagrams illustrating examples of a cigarette being inserted into an aerosol generating device.

FIGS. 11 and 12 are diagrams illustrating examples of a cigarette.

FIG. 13 is a block diagram illustrating an aerosol generating device according to another embodiment.

BEST MODE FOR CARRYING OUT THE INVENTION

[0025] Hereinafter, embodiments are described in detail with reference to the accompanying drawings. The following description is one of several aspects of embodiments and the following description forms part of the detailed description of the embodiments. In describing an embodiment, a detailed description of a well-known function or configuration is omitted to clarify the present invention.

[0026] However, various alterations and modifications may be made to the embodiments. Here, the embodiments are not construed as limited to the disclosure. The embodiments should be understood to include all changes, equivalents, and replacements within the idea and the technical scope of the disclosure.

[0027] In addition, terms or words used in the present specification and claims should not be construed in general meanings or dictionary definitions, and based on a principle that the inventor may properly define the concept of terms to best describe their invention, the terms or

words should be construed as meanings and concepts consistent with the technical idea of the invention according to an embodiment.

[0028] The singular forms "a", "an", and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises/comprising" and/or "includes/including" when used herein, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components and/or groups thereof.

[0029] Unless otherwise defined, all terms including technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which embodiments belong. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0030] When describing the embodiments with reference to the accompanying drawings, like reference numerals refer to like constituent elements and a repeated description related thereto will be omitted. In the description of embodiments, detailed description of well-known related structures or functions will be omitted when it is deemed that such description will cause ambiguous interpretation of the present disclosure.

[0031] Also, in the description of the components, terms such as first, second, A, B, (a), (b) or the like may be used herein when describing components of the present disclosure. These terms are used only for the purpose of discriminating one constituent element from another constituent element, and the nature, the sequences, or the orders of the constituent elements are not limited by the terms. When one constituent element is described as being "connected", "coupled", or "attached" to another constituent element, it should be understood that one constituent element can be connected or attached directly to another constituent element, and an intervening constituent element can also be "connected", "coupled", or "attached" to the constituent elements.

[0032] The same name may be used to describe an element included in the embodiments described above and an element having a common function. Unless otherwise mentioned, the descriptions of the example embodiments may be applicable to the following example embodiments, and thus duplicated descriptions will be omitted for conciseness.

[0033] Terms such as "unit," "module," etc., as used in the specification may refer to a part for processing at least one function or operation and which may be implemented as hardware, software, or a combination of hardware and software.

[0034] FIG. 1 is a block diagram illustrating an aerosol

generating device according to an embodiment.

[0035] Referring to FIG. 1, the aerosol generating device according to an embodiment may include a surface wave generator 41, a supplier 45, a substrate unit 47, and an inhaler 49.

[0036] The surface wave generator 41 may generate a surface acoustic wave configured to atomize a liquid. The surface acoustic wave may be an acoustic wave transmitted along the surface of an elastic body substrate and may be generated from an electrical signal as a result of a piezoelectric effect. A surface acoustic wave generated in the surface wave generator 41 may atomize an aerosol forming substrate that has been met. The surface acoustic wave generated in the surface wave generator 41 may be transmitted to the substrate unit 47.

[0037] The surface wave generator 41 may be designed to operate to generate a surface acoustic wave only when a user inhales the aerosol generating device. For example, the surface wave generator 41 may include a respiratory sensor (not shown). The respiratory sensor mounted to the surface wave generator 41 may sense that the user inhales the aerosol generating device and may generate an electrical control signal such that the surface wave generator may operate only when the user inhales the aerosol generating device.

[0038] The supplier 45 may store an aerosol forming substrate and may supply the stored aerosol forming substrate to the substrate unit 47. The aerosol forming substrate may be a liquid form, and the supplier 45 may store different types of a plurality of aerosol forming substrates. For example, the aerosol forming substrates that may be stored in the supplier 45 may include a nicotine solution of a preset concentration. The aerosol forming substrates may also include a liquid including a flavor or a liquid including a health functional substance or another functional substance. Likewise, various types of liquids other than a nicotine solution may be stored in the supplier 47.

[0039] The substrate unit 47 may receive an aerosol forming substrate from the supplier 45. The substrate unit 47 may receive a surface acoustic wave from the surface wave generator 41. The surface acoustic wave transmitted from the supplier 45 to the substrate unit 47 may atomize the aerosol forming substrate supplied from the supplier to the substrate unit 47. In other words, the atomization of the aerosol forming substrate may be performed in the substrate unit 47. The atomized aerosol forming substrate may be in an aerosol state such that the user may inhale.

[0040] The user may inhale an aerosol generated through the atomization in the substrate unit 47 through the inhaler 49. An inhaler may include a flow path (not shown) through which the generated aerosol may move and a mouthpiece (not shown) through which the user may inhale.

[0041] However, FIG. 1 only conceptually illustrates a connection and operation state of components of the aerosol generating device according to an embodiment

without illustrating the physical arrangement of each of the components, and this also applies to the descriptions with reference to the following drawings.

[0042] FIG. 2 is a block diagram illustrating the aerosol generating device according to an embodiment, including a channel element and a storage element.

[0043] Referring to FIG. 2, the supplier 45 of the aerosol generating device according to an embodiment may include a storage element 451 and a channel element 452. The storage element 451 may store an aerosol forming substrate. As described above, the aerosol forming substrate may be a liquid form, and the storage element 451 may include a housing (not shown) configured to accommodate liquid.

[0044] The channel element 452 may move the aerosol forming substrate stored in the storage element 451 in a direction toward the substrate unit 47. The channel element 452 may connect the storage element 451 to the substrate unit 47 and may cause a capillary phenomenon between the storage element 451 and the substrate unit 47. For example, the channel element 452 may be a porous wick. The channel element 452 may be a porous structure formed by sintering with polymers, ceramics, or the like. The channel element 452 may be a paper filter or a cotton wick. The channel element 452 may be formed in a microchannel that conveys a micro volumetric fluid. However, the form of the channel element 452 is not limited to the foregoing examples, and this also applies to the descriptions below.

[0045] The aerosol forming substrate that has moved through the channel element 452 to the substrate unit 47 may be applied on the substrate unit 47 such that the aerosol forming substrate may be atomized easily by the substrate wave generator 41. In other words, the aerosol forming substrate supplied in a liquid form to the substrate unit 47 may remain applied on the surface of the substrate unit 47.

[0046] The aerosol forming substrate that has moved from the storage element 451 through the channel element 452 to the substrate unit 47 may be atomized by the surface acoustic wave transmitted from the surface wave generator 41 to the substrate unit 47, and the user may inhale the atomized aerosol forming substrate through the inhaler 49.

[0047] FIG. 3 is a diagram illustrating the aerosol generating device according to an embodiment, including a plurality of storage elements.

[0048] Referring to FIG. 3, the supplier 45 may include a first storage element 4511 and a second storage element 4512. The number of storage elements 451 that may be included in the supplier 45 is not limited thereto, and an additional storage element may be included in the supplier as needed. The number of storage elements may increase or decrease, corresponding to the type of aerosol forming substrate to be atomized.

[0049] The first storage element 4511 may store a first liquid. The second storage element 4512 may store a second liquid. The first liquid and the second liquid may

be the aerosol forming substrates described above and may be different types of liquid. The channel element 452 may be connected to the first storage element 4511 and the second storage element 4512 and may supply the first liquid and the second liquid stored respectively in the first storage element 4511 and the second storage element 4512 to the substrate unit 47. The first liquid stored in the first storage element 4511 and the second liquid stored in the second storage element 4512 may be mixed together while being moved through the channel element 452. The channel element 452 may mix the first liquid with the second liquid and may supply the mixed first and second liquids to the substrate unit 47.

[0050] The first liquid and the second liquid moved respectively from the first storage element 4511 and the second storage element 4512 through the channel element 452 to the substrate unit 47 may be atomized by a surface acoustic wave transmitted from the surface wave generator 41 to the substrate unit 47, and a user may inhale the atomized first and second liquids through the inhaler 49.

[0051] FIG. 4 is a diagram illustrating the aerosol generating device according to an embodiment, including a plurality of channel elements.

[0052] Referring to FIG. 4, the supplier 45 may include the first storage element 4511, the second storage element 4512, a first channel element 4521, and a second channel element 4522.

[0053] The first storage element 4511 may store a first liquid. The second storage element 4512 may store a second liquid. The first liquid and the second liquid may be the aerosol forming substrates described above and may be different types of liquid.

[0054] The first channel element 4521 may move the first liquid stored in the first storage element 4511 to the substrate unit 47. The second channel element 4522 may move the second liquid stored in the second storage element 4512 to the substrate unit 47. The first channel element 4521 and the second channel element 4522 may operate independently and may respectively move the first liquid and the second liquid through separate means. For example, the first channel element 4521 may supply the first liquid to the substrate unit through a capillary phenomenon, and the second channel element 4522 may be formed in a microchannel including a separate power means and may supply the second liquid to the substrate unit 47. The first channel element 4521 may continuously supply the first liquid to the substrate unit through a capillary phenomenon, and the second channel element 4522 may include a valve unit and control the opening and closing of a channel and may or may not supply the second liquid to the substrate unit 47. As the supplier 45 includes the first channel element 4521 and the second channel element 4522, the first liquid and the second liquid may be supplied independently to the substrate unit 47. Accordingly, the atomization of the first liquid may be controlled independently of the atomization of the second liquid. The form of the first channel element

4521 and the form of the second channel element 4522 are not limited to the foregoing examples, and this also applies to the descriptions below.

[0055] The first liquid and the second liquid moved respectively from the first storage element 4511 and the second storage element 4512 through the first channel element 4521 and the second channel element 4522 to the substrate unit 47 may be atomized by a surface acoustic wave transmitted from the surface wave generator 41 to the substrate unit 47, and a user may inhale the atomized first and second liquids through the inhaler 49.

[0056] FIGS. 5A and 5B are diagrams each illustrating the aerosol generating device according to an embodiment, including an additional storage element and an additional channel element.

[0057] Referring to FIG. 5A, the supplier 45 may include the first storage element 4511, the second storage element 4512, a third storage element 4513, the first channel element 4521, the second channel element 4522, and a third channel element 4523.

[0058] The first storage element 4511 may store a first liquid. The second storage element 4512 may store a second liquid. The first liquid and the second liquid may be the aerosol forming substrates described above and may be different types of liquid.

[0059] The first channel element 4521 may move the first liquid stored in the first storage element 4511 to the third storage element 4513. The second channel element 4522 may move the second liquid stored in the second storage element 4512 to the third channel element 4513.

[0060] The first liquid supplied from the first storage element 4511 may be mixed with the second liquid supplied from the second storage element 4512 in the third storage element 4513. In this case, the surface wave generator 41 may transmit a surface acoustic wave to the third storage element 4513. The surface acoustic wave transmitted from the surface wave generator 41 to the third storage element 4513 may facilitate the mixing of the first liquid and the second liquid. The third channel element 4523 may transmit the first liquid and the second liquid that are mixed in the third storage element 4513 to the substrate unit 47.

[0061] The first channel element 4521, the second channel element 4522, and the third channel element 4523 may operate independently and may respectively move the first liquid and the second liquid through separate means as described above.

[0062] A mixed liquid of the first liquid and the second liquid moved from the third storage element 4513 through the third channel element 4523 to the substrate unit 47 may be atomized by a surface acoustic wave transmitted from the surface wave generator 41 to the substrate unit 47, and a user may inhale the atomized mixed liquid through the inhaler 49.

[0063] Referring to FIG. 5B, the surface wave generator 41 may include a first surface wave generating element 411 and a second surface wave generating element

412.

[0064] The first surface wave generating element 411 may transmit a surface acoustic wave to the substrate unit 47. The surface acoustic wave transmitted from the first surface wave generating element 411 to the substrate unit 47 may atomize an aerosol forming substrate of the substrate unit 47. The second surface wave generating element 412 may transmit a surface acoustic wave to the third storage element 4513. The surface acoustic wave transmitted from the second surface wave generating element 412 to the third storage element 4513 may facilitate the mixing of the first liquid and the second liquid performed in the third storage element 4513. The configuration and function of the first storage element 4511, the second storage element 4512, the third storage element 4513, the first channel element 4521, the second channel element 4522, the third channel element 4523, the substrate unit 47, and the inhaler 49 may be the same as those of FIG. 5A.

[0065] FIGS. 6A and 6B are diagrams each illustrating the aerosol generating device according to an embodiment, including a control element.

[0066] Referring to FIG. 6A, the supplier 45 may include the first storage element 4511, the second storage element 4512, the first channel element 4521, the second channel element 4522, and a control element 453.

[0067] The first channel element 4521 may move the first liquid stored in the first storage element 4511 to the substrate unit 47. The second channel element 4522 may move the second liquid stored in the second storage element 4512 to the substrate unit 47. The first channel element 4521 may operate independently of the second channel element 4522.

[0068] The control element 453 may control a rate of flow of an aerosol forming substrate in liquid that moves through the channel element 452. For example, the control element 453 may control a rate of flow of the first liquid that moves through the first channel element 4521. The control element 453 may control a rate of flow of the second liquid that moves through the second channel element 4522. The control element 453 may control a flow of rate of moving liquid by controlling the speed of the moving liquid. The control element 453 may be, for example, a micro pump. The control element 453 may supply the first liquid, the second liquid, or all of them at a speed of 0.1 ml/s to 1 ml/s to the substrate unit 47. The control element 453 may include a power unit (not shown) configured to control a rate of flow of liquid. A rate of flow of each liquid supplied to the substrate unit 47 may be controlled to control an atomization amount of an aerosol generated in the substrate unit 47.

[0069] The first liquid and the second liquid moved respectively from the first storage element 4511 and the second storage element 4512 through the channel element 452 and the control element 453 to the substrate unit 47 may be atomized by a surface acoustic wave transmitted from the surface wave generator 41 to the substrate unit 47, and a user may inhale the atomized first

and second liquids through the inhaler 49.

[0070] Referring to FIG. 6B, the supplier 45 may include a plurality of control elements 453. For example, the supplier 45 may include a first control element 4531 and a second control element 4532. The first control element 4531 may control a rate of flow of the first liquid that moves through the first channel element 4521. The second control element 4532 may control a rate of flow of the second liquid that moves through the second channel element 4522. The first control element 4531 may operate independently of the second control element 4532. The configuration and function of the first storage element 4511, the second storage element 4512, the first channel element 4521, the second channel element 4522, the surface wave generator 41, the substrate unit 47, and the inhaler 49 may be the same as those of FIG. 6A.

[0071] FIG. 7 is a diagram illustrating the aerosol generating device according to an embodiment, including a reactor.

[0072] Referring to FIG. 7, the aerosol generating device according to an embodiment may include the surface wave generator 41, the supplier 45, the substrate unit 47, a reactor 48, and the inhaler 49.

[0073] The supplier 45 may include the first storage element 4511, the second storage element 4512, the first channel element 4521, the second channel element 4522, the first control element 4531 and the second control element 4532.

[0074] The substrate unit 47 may include the first substrate 471 and the second substrate 472. A first liquid stored in the first storage element 4511 may be moved through the first channel element 4521 and the first control element 4531 to a first substrate 471. A second liquid stored in the second storage element 4512 may be moved through the second channel element 4522 and the second control element 4532 to a second substrate 472.

[0075] The surface wave generator 41 may include the first surface wave generating element 411 and the second surface wave generating element 412. The first surface wave generating element 411 may transmit a surface acoustic wave to the first substrate 471 of the substrate unit 47. The second surface wave generating element 412 may transmit a surface acoustic wave to the second substrate 472 of the substrate unit 47.

[0076] The first liquid that has moved to the first substrate 471 may be atomized by the surface acoustic wave transmitted from the first surface wave generating element 411. The second liquid that has moved to the second substrate 472 may be atomized by the surface acoustic wave transmitted from the second surface wave generating element 412.

[0077] The first liquid atomized in the first substrate 471 and the second liquid atomized in the second substrate 472 may meet and react with each other in the reactor 48. The atomized first liquid and the atomized second liquid may react in the reactor 48 and may form an inhalable

aerosol. The reactor 48 may include a separate housing (not shown) in which the atomized first liquid is mixed with the atomized second liquid. A user may inhale the inhalable aerosol formed in the reactor 48 through the inhaler 49.

[0078] FIGS. 8 to 10 are diagrams illustrating examples of a cigarette being inserted into an aerosol generating device.

[0079] Referring to FIG. 8, an aerosol generating device 1 includes a battery 11, a controller 12, and a heater 13. Referring to FIGS. 8 and 10, the aerosol generating device 1 may further include a vaporizer 14. In addition, a cigarette 2 may be inserted into an inner space of the aerosol generating device 1.

[0080] The aerosol generating device 1 shown in FIGS. 8 to 10 may include components related to the embodiments described herein. Therefore, it is to be understood by those having ordinary skill in the art to which the present disclosure pertains that the aerosol generating device 1 may further include other generally used components in addition to the ones shown in FIGS. 8 to 10.

[0081] In addition, although it is shown that the heater 13 is included in the aerosol generating device 1 in FIGS. 9 and 10, the heater 13 may be omitted as needed.

[0082] FIG. 8 illustrates a linear alignment of the battery 11, the controller 12, and the heater 13. FIG. 9 illustrates a linear alignment of the battery 11, the controller 12, the vaporizer 14, and the heater 13. FIG. 10 illustrates a parallel alignment of the vaporizer 14 and the heater 13. However, the internal structure of the aerosol generating device 1 is not limited to the internal structure illustrated in FIGS. 8 to 10. That is, such alignments of the battery 11, the controller 12, the heater 13, and the vaporizer 14 may be changed depending on the design of the aerosol generating device 1.

[0083] When the cigarette 2 is inserted into the aerosol generating device 1, the aerosol generating device 1 may actuate the heater 13 and/or the vaporizer 14 to generate an aerosol. The aerosol generated by the heater 13 and/or the vaporizer 14 may pass through the cigarette 2 into the user.

[0084] Even when the cigarette 2 is not inserted in the aerosol generating device 1, the aerosol generating device 1 may heat the heater 13 as needed.

[0085] The battery 11 may supply power to be used to operate the aerosol generating device 1. For example, the battery 11 may supply power to heat the heater 13 or the vaporizer 14 and may supply power required for the controller 12 to operate. In addition, the battery 11 may supply power required to operate a display, a sensor, a motor, or the like installed in the aerosol generating device 1.

[0086] The controller 12 may control the overall operation of the aerosol generating device 1. For example, the controller 12 may control respective operations of other components included in the aerosol generating device 1 in addition to the battery 11, the heater 13, and the

vaporizer 14. In addition, the controller 12 may verify a state of each of the components of the aerosol generating device 1 to determine whether the aerosol generating device 1 is in an operable state.

[0087] The controller 12 may include at least one processor. The processor may be implemented as an array of a plurality of logic gates or may be implemented as a combination of a general-purpose microprocessor and a memory in which a program executable by the microprocessor is stored. In addition, it is to be understood by one of ordinary skill in the art to which the present disclosure pertains that the processor may be implemented in other types of hardware.

[0088] The heater 13 may be heated by the power supplied by the battery 11. For example, when the cigarette 2 is inserted in the aerosol generating device 1, the heater 13 may be outside the cigarette. The heated heater 13 may thus raise the temperature of an aerosol generating material in the cigarette.

[0089] The heater 13 may be an electrically resistive heater. In this example, the heater 13 may include an electrically conductive track, and the heater 13 may be heated as a current flows through the electrically conductive track. However, the heater 13 is not limited to the above-described example, and any example of heating the heater 13 up to a desired temperature may be applicable without limitation. The desired temperature may be preset in the aerosol generating device 1 or may be set by the user.

[0090] Meanwhile, as another example, the heater 13 may be an induction heater. Specifically, the heater 13 may include an electrically conductive coil for heating the cigarette in an induction heating manner, and the cigarette may include a susceptor to be heated by the induction heater.

[0091] For example, the heater 13 may include a tubular heating element, a plate-shaped heating element, a needle-shaped heating element, or a rod-shaped heating element and may heat the inside or outside of the cigarette 2 according to the shape of a heating element.

[0092] In addition, the heater 13 may be provided as a plurality of heaters in the aerosol generating device 1. In this case, the plurality of heaters 13 may be placed to be inserted into the cigarette 2 or may be outside the cigarette 2. In addition, some of the heaters 13 may be placed to be inserted into the cigarette 2, and the rest may be outside the cigarette 2. However, the shape of the heater 13 is not limited to the shape illustrated in FIGS. 1 to 3 but may be provided in various shapes.

[0093] The vaporizer 14 may heat a liquid composition to generate an aerosol, and the generated aerosol may pass through the cigarette 2 into the user. That is, the aerosol generated by the vaporizer 14 may travel along an airflow path of the aerosol generating device 1, and the airflow path may be configured such that the aerosol generated by the vaporizer 14 passes through the cigarette 2 into the user.

[0094] For example, the vaporizer 14 may include a

liquid storage, a liquid transfer means, and a heating element. However, embodiments are not limited thereto. For example, the liquid storage, the liquid transfer means, and the heating element may be included as independent modules in the aerosol generating device 1.

[0095] The liquid storage may store the liquid composition. The liquid composition may be, for example, a liquid including a tobacco-containing material that includes a volatile tobacco flavor component or may be a liquid including a non-tobacco material. The liquid storage may be manufactured to be detachable and attachable from and to the vaporizer 14 or may be manufactured in an integral form with the vaporizer 14.

[0096] The liquid composition may include, for example, water, a solvent, ethanol, a plant extract, a fragrance, a flavoring agent, or a vitamin mixture. The fragrance may include, for example, menthol, peppermint, spearmint oil, various fruit flavor ingredients, and the like. However, embodiments are not limited thereto. The flavoring agent may include ingredients that provide a user with a variety of flavors or scents. The vitamin mixture may be a mixture of at least one of vitamin A, vitamin B, vitamin C, or vitamin E, but is not limited thereto. The liquid composition may also include an aerosol former such as glycerin and propylene glycol.

[0097] The liquid transfer means may transfer the liquid composition in the liquid storage to the heating element. The liquid transfer means may be, for example, a wick such as cotton fiber, ceramic fiber, glass fiber, or porous ceramic, but is not limited thereto.

[0098] The heating element may be an element configured to heat the liquid composition transferred by the liquid transfer means. The heating element may be, for example, a metal heating wire, a metal heating plate, a ceramic heater, or the like. However, embodiments are not limited thereto. Further, the heating element may include a conductive filament such as a nichrome wire and may be arranged in a structure wound around the liquid transfer means. The heating element may be heated as a current is supplied and may transfer heat to the liquid composition in contact with the heating element and may thereby heat the liquid composition. As a result, an aerosol may be generated.

[0099] For example, the vaporizer 14 may also be referred to as a cartomizer or an atomizer. However, embodiments are not limited thereto.

[0100] Meanwhile, the aerosol generating device 1 may further include general-purpose components in addition to the battery 11, the controller 12, the heater 13, and the vaporizer 14. For example, the aerosol generating device 1 may include a display that outputs visual information and/or a motor that outputs tactile information. In addition, the aerosol generating device 1 may include at least one sensor (e.g., a puff sensor, a temperature sensor, a cigarette insertion detection sensor, etc.). In addition, the aerosol generating device 1 may be manufactured to have a structure in which external air may be introduced or internal gas may flow out even with

the cigarette 2 being inserted.

[0101] Although not shown in FIGS. 8 to 10, the aerosol generating device 1 may constitute a system along with a separate cradle. For example, the cradle may be used to charge the battery 11 of the aerosol generating device 1. Alternatively, the cradle may be used to heat the heater 13, with the cradle and the aerosol generating device 1 coupled.

[0102] The cigarette 2 may be of a similar type to a general burning type. For example, the cigarette 2 may be divided into a first portion including an aerosol generating material and a second portion including a filter or the like. Alternatively, the second portion of the cigarette 2 may also include the aerosol generating material. For example, the aerosol generating material provided in the form of granules or capsules may be inserted into the second portion.

[0103] The first portion may be entirely inserted into the aerosol generating device 1, and the second portion may be exposed outside. Alternatively, only the first portion may be partially inserted into the aerosol generating device 1, or the first portion may be entirely into the aerosol generating device 1 and the second portion may be partially inserted into the aerosol generating device 1. The user may inhale the aerosol with the second portion in their mouth. In this case, the aerosol may be generated as external air passes through the first portion, and the generated aerosol may pass through the second portion into the mouth of the user.

[0104] For example, the external air may be introduced through at least one air path formed in the aerosol generating device 1. In this example, the opening or closing and/or the size of the air path formed in the aerosol generating device 1 may be adjusted by the user. Accordingly, an amount of atomization, a sense of smoking, or the like may be adjusted by the user. In another example, the external air may be introduced into the inside of the cigarette 2 through at least one hole formed on a surface of the cigarette 2.

[0105] Hereinafter, examples of the cigarette 2 will be described with reference to FIGS. 11 and 12.

[0106] FIGS. 11 and 12 are diagrams illustrating examples of a cigarette.

[0107] Referring to FIG. 11, the cigarette 2 may include a tobacco rod 21 and a filter rod 22. The first portion and the second portion described above with reference to FIGS. 1 to 3 may include the tobacco rod 21 and the filter rod 22, respectively.

[0108] Although the filter rod 22 is illustrated as having a single segment in FIG. 11, examples of which are not limited thereto. That is, the filter rod 22 may include a plurality of segments. For example, the filter rod 22 may include a segment that cools an aerosol and a segment that filters a predetermined ingredient contained in an aerosol. In addition, the filter rod 22 may further include at least one segment that performs another function as needed.

[0109] The diameter of the cigarette 2 may be in a

range of 5 mm to 9 mm, and the length thereof may be about 48 mm. However, embodiments are not limited thereto. For example, a length of the tobacco rod 21 may be about 12 mm, a length of a first segment of the filter rod 22 may be about 10 mm, a length of a second segment of the filter rod 22 may be about 14 mm, and a length of a third segment of the filter rod 22 may be about 12 mm. However, embodiments are not limited thereto.

[0110] The cigarette 2 may be wrapped with at least one wrapper 24. The wrapper 24 may have at least one hole through which external air is introduced or internal gas flows out. In an example, the cigarette 2 may be wrapped with one wrapper 24. In another example, the cigarette 2 may be wrapped with two or more wrappers 24 in an overlapping manner. For example, the tobacco rod 21 may be wrapped with a first wrapper 241, and the filter rod 22 may be wrapped with wrappers 242, 243, and 244. In addition, the cigarette 2 may be entirely wrapped again with a single wrapper 245. For example, when the filter rod 22 includes a plurality of segments, the plurality of segments may be wrapped with the wrappers 242, 243, and 244, respectively.

[0111] The first wrapper 241 and the second wrapper 242 may be formed with general filter wrapping paper. For example, the first wrapper 241 and the second wrapper 242 may be porous wrapping paper or non-porous wrapping paper. In addition, the first wrapper 241 and the second wrapper 242 may be formed of oilproof paper and/or an aluminum laminated wrapping material.

[0112] The third wrapper 243 may be formed of hard wrapping paper. For example, a basis weight of the third wrapper 243 may be in a range of 88 g/m² to 96 g/m² and may be desirably in a range of 90 g/m² to 94 g/m². In addition, the thickness of the third wrapper 243 may be in a range of 120 μm to 130 μm, and desirably, may be 125 μm.

[0113] The fourth wrapper 244 may be formed of oil-proof hard wrapping paper. For example, a basis weight of the fourth wrapper 244 may be in a range of 88 g/m² to 96 g/m² and may be desirably in a range of 90 g/m² to 94 g/m². In addition, the thickness of the fourth wrapper 244 may be in a range of 120 μm to 130 μm, and desirably, may be 125 μm.

[0114] The fifth wrapper 245 may be formed of sterile paper (e.g., MFW). Here, the sterilized paper (MFW) may refer to paper specially prepared to enhance tensile strength, water resistance, smoothness, or the like, compared to general paper. For example, a basis weight of the fifth wrapper 245 may be in a range of about 57 g/m² to about 63 g/m² and may desirably be about 60 g/m². In addition, the thickness of the fifth wrapper 245 may be in a range of 64 μm to 70 μm, and desirably, may be 67 μm.

[0115] The fifth wrapper 245 may have a predetermined material internally added thereto. The predetermined material may be, for example, silicon. However, embodiments are not limited thereto. Silicon may have properties such as, for example, heat resistance with less change by temperature, oxidation resistance, which re-

fers to resistance to oxidation, resistance to various chemicals, water repellency against water, or electrical insulation. However, silicon may not necessarily be used, and any material having such properties described above may be applied to (or used to coat) the fifth wrapper 245 without limitation.

[0116] The fifth wrapper 245 may prevent the cigarette 2 from burning. For example, there may be a probability that the cigarette 2 burns when the tobacco rod 210 is heated by the heater 13. For example, when the temperature rises above an ignition point of any one of materials included in the tobacco rod 310, the cigarette 2 may burn. Even in this case, it may still be possible to prevent the cigarette 2 from burning because the fifth wrapper 245 includes a non-combustible material.

[0117] In addition, the fifth wrapper 245 may prevent a holder 1 from being contaminated by substances produced in the cigarette 2. For example, liquid substances may be produced in the cigarette 2 when a user puffs. For example, as an aerosol generated in the cigarette 2 is cooled by external air, such liquid substances (e.g., water, etc.) may be produced. Thus, wrapping the cigarette 2 with the fifth wrapper 245 may prevent the liquid substances produced in the cigarette 2 from leaking out of the cigarette 2.

[0118] The tobacco rod 21 may include an aerosol generating material. The aerosol generating material may include, for example, at least one of glycerin, propylene glycol, ethylene glycol, dipropylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, or oleyl alcohol. However, embodiments are not limited thereto. The tobacco rod 21 may also include other additives, such as a flavoring agent, a wetting agent, and/or an organic acid. In addition, the tobacco rod 21 may include a flavoring liquid such as menthol or a moisturizer that is added by being sprayed onto the tobacco rod 21.

[0119] The tobacco rod 21 may be manufactured in various forms. For example, the tobacco rod 21 may be manufactured as a sheet or as a strand. Alternatively, the tobacco rod 21 may be formed of tobacco leaves finely cut from a tobacco sheet. In addition, the tobacco rod 21 may be enveloped by a thermally conductive material. The thermally conductive material may be, for example, a metal foil such as an aluminum foil, but is not limited thereto. For example, the thermally conductive material enveloping the tobacco rod 21 may evenly distribute the heat transferred to the tobacco rod 21 to improve the conductivity of the heat to be applied to the tobacco rod thereby improving the taste of tobacco. In addition, the thermally conductive material enveloping the tobacco rod 21 may function as a susceptor heated by an induction heater. Here, although not shown in the drawings, the tobacco rod 21 may further include an additional susceptor in addition to the thermally conductive material enveloping the outside thereof.

[0120] The filter rod 22 may be a cellulose acetate filter. However, the form of the filter rod 22 is not limited. For

example, the filter rod 22 may be a cylindrical rod, or a tubular rod including a hollow therein. The filter rod 22 may also be a recess-type rod. For example, when the filter rod 22 includes a plurality of segments, at least one of the segments may be manufactured in a different shape.

[0121] A third segment of the filter rod 22 may be a cellulose acetate filter. For example, the first segment may be a tubular structure, including a hollow therein. In this example, the first segment may prevent internal materials of the tobacco rod 210 from being pushed back when the heater 13 is inserted and generate an aerosol cooling effect. A desirable diameter of the hollow included in the first segment may be adopted from a range of 2 mm to 4.5 mm, but embodiments are not limited thereto.

[0122] A desirable length of the first segment may be adopted from a range of about 4 mm to about 30 mm, but embodiments are not limited thereto. The length of the first segment may be desirably 10 mm, but the length is not limited thereto.

[0123] The first segment may have a hardness that may be adjusted by adjusting the content of a plasticizer in a process of manufacturing the first segment. In addition, the first segment may be manufactured by inserting a structure such as a film or a tube of the same or different materials inside (e.g., the hollow).

[0124] A second segment of the filter rod 22 may cool an aerosol generated as the heater 13 heats the tobacco rod 21. The user may thus inhale the aerosol cooled down to a suitable temperature.

[0125] The length or diameter of the second segment may be determined in various ways according to the shape of the cigarette 2. For example, a desirable length of the second segment may be adopted from a range of 7 mm to 20 mm. The length of the second segment may be desirably about 14 mm. However, embodiments are not limited thereto.

[0126] The second segment may be manufactured by weaving a polymer fiber. In this case, a flavoring liquid may be applied to a fiber formed of a polymer. As another example, the second segment may be manufactured by weaving a separate fiber, to which a flavoring liquid is applied, and the fiber, formed of the polymer, together. Alternatively, the second segment may be formed of a crimped polymer sheet.

[0127] For example, the polymer may be prepared with a material selected from a group consisting of polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), polyethylene terephthalate (PET), polylactic acid (PLA), cellulose acetate (CA), and aluminum foil.

[0128] As the second segment is formed of the woven polymer fiber or the crimped polymer sheet, the second segment may include a single channel or a plurality of channels extending in a longitudinal direction. A channel used herein may refer to a path through which a gas (e.g., air or aerosol) passes.

[0129] For example, the second segment formed of the crimped polymer sheet may be formed of a material

having a thickness between about 5 μm and about 300 μm , for example, between about 10 μm and about 250 μm . In addition, a total surface area of the second segment may be in a range of about 300 mm^2/mm to about 1000 mm^2/mm . Further, an aerosol cooling element may be formed of a material having a specific surface area between about 10 mm^2/mg and about 100 mm^2/mg .

[0130] Meanwhile, the second segment may include a thread containing a volatile flavor ingredient. The volatile flavor ingredient may be menthol. However, embodiments are not limited thereto. For example, the thread may be filled with an amount of menthol sufficient to provide at least 1.5 mg of menthol to the second segment.

[0131] A third segment of the filter rod 22 may be a cellulose acetate filter. A desirable length of the third segment may be adopted from a range of 4 mm to 20 mm. For example, the length of the third segment may be about 12 mm. However, embodiments are not limited thereto.

[0132] The third segment may be manufactured such that a flavor is generated by spraying a flavoring liquid onto the third segment in a process of manufacturing the third segment. Alternatively, a separate fiber to which the flavoring liquid is applied may be inserted into the third segment. An aerosol generated by the tobacco rod 21 may be cooled as it passes through the second segment of the filter rod 22, and the cooled aerosol may pass through the third segment into the user. Accordingly, when a flavoring element is added to the third segment, the durability of the flavor to be delivered to the user may be enhanced.

[0133] In addition, the filter rod 22 may include at least one capsule 23. The capsule 23 may perform a function of generating a flavor, or a function of generating an aerosol. For example, the capsule 23 may be of a structure in which a liquid containing a fragrance is wrapped with a film. The capsule 23 may have a spherical or cylindrical shape. However, example embodiments are not limited thereto.

[0134] Referring to FIG. 12, a cigarette 3 may further include a front end plug 33. The front end plug 33 may be placed on one side of a tobacco rod 31 facing a filter rod 32. The front end plug 33 may prevent the tobacco rod 31 from escaping to the outside and may also prevent an aerosol liquefied from the tobacco rod 31 during smoking from flowing into an aerosol generating device (e.g., the aerosol generating device 1 of FIGS. 8 to 10).

[0135] The filter rod 32 may include a first segment 321 and a second segment 322. Here, the first segment 321 may correspond to the first segment of the filter rod 22 of FIG. 11, and the second segment 322 may correspond to the third segment of the filter rod 22 of FIG. 11.

[0136] The diameter and the total length of the cigarette 3 may correspond to the diameter and the total length of the cigarette 2 of FIG. 11. For example, the length of the front end plug 33 may be about 7 mm, the length of the tobacco rod 31 may be about 15 mm, the length of the first segment 321 may be about 12 mm, and the length of the

second segment 322 may be about 14 mm. However, embodiments are not limited thereto.

[0137] The cigarette 3 may be wrapped with at least one wrapper 35. The wrapper 35 may have at least one hole through which external air flows inside or internal gas flows outside. For example, the front end plug 33 may be wrapped with a first wrapper 351, the tobacco rod 31 may be wrapped with a second wrapper 352, the first segment 321 may be wrapped with a third wrapper 353, and the second segment 322 may be wrapped with a fourth wrapper 354. In addition, the cigarette 3 may be entirely wrapped again with a fifth wrapper 355.

[0138] In addition, at least one perforation 36 may be formed in the fifth wrapper 355. For example, the perforation 36 may be formed in an area surrounding the tobacco rod 31, but the forming area is not limited thereto. The perforation 36 may perform a function of transferring heat generated by the heater 13 shown in FIGS. 11 and 12 to the inside of the tobacco rod 31.

[0139] In addition, the second segment 322 may include at least one capsule 34. The capsule 34 may perform a flavor generating function or an aerosol generating function. For example, the capsule 34 may have a structure in which a liquid containing a fragrance is wrapped with a film. The capsule 34 may have a spherical or cylindrical shape. However, embodiments are not limited thereto.

[0140] The first wrapper 351 may be a combination of general filter wrapping paper and a metal foil such as aluminum foil. For example, the total thickness of the first wrapper 351 may be in a range of 45 μm to 55 μm and may be desirably 50.3 μm . In addition, the thickness of the metal foil of the first wrapper 351 may be in a range of 6 μm to 7 μm and may be desirably about 6.3 μm . In addition, the basis weight of the first wrapper 351 may be in a range of 50 g/m^2 to 55 g/m^2 and may be desirably about 53 g/m^2 .

[0141] The second wrapper 352 and the third wrapper 353 may be formed with general filter wrapping paper. For example, the second wrapper 352 and the third wrapper 353 may be porous wrapping paper or non-porous wrapping paper.

[0142] For example, the porosity of the second wrapper 352 may be about 35000 CU. However, embodiments are not limited thereto. In addition, the thickness of the second wrapper 352 may be in a range of 70 μm to 80 μm and may be desirably about 78 μm . In addition, the basis weight of the second wrapper 352 may be in a range of 20 g/m^2 to 25 g/m^2 and may be desirably about 23.5 g/m^2 .

[0143] For example, the porosity of the third wrapper 353 may be about 24000 CU. However, embodiments are not limited thereto. In addition, the thickness of the third wrapper 353 may be in a range of 60 μm to 70 μm and may be desirably about 68 μm . In addition, the basis weight of the third wrapper 353 may be in a range of 20 g/m^2 to 25 g/m^2 and may be desirably about 21 g/m^2 .

[0144] The fourth wrapper 354 may be formed of PLA

laminated paper. The PLA laminated paper may refer to three-ply paper including a paper layer, a PLA layer, and a paper layer. For example, the thickness of the fourth wrapper 354 may be in a range of 100 μm to 120 μm and may be desirably about 110 μm . In addition, the basis weight of the fourth wrapper 354 may be in a range of 80 g/m^2 to 100 g/m^2 and may be desirably about 88 g/m^2 .

[0145] The fifth wrapper 355 may be formed of sterile paper (MFW). Here, the sterilized paper (MFW) may refer to paper specially prepared to enhance tensile strength, water resistance, smoothness, or the like, compared to general paper. For example, the basis weight of the fifth wrapper 355 may be in a range of 57 g/m^2 to 63 g/m^2 and may be desirably about 60 g/m^2 . In addition, the thickness of the fifth wrapper 355 may be in a range of 64 μm to 70 μm and may be desirably about 67 μm .

[0146] The fifth wrapper 355 may have a predetermined material internally added thereto. The predetermined material may be, for example, silicon. However, embodiments are not limited thereto. Silicon may have properties such as, for example, heat resistance with less change by temperature, oxidation resistance, which refers to resistance to oxidation, resistance to various chemicals, water repellency against water, or electrical insulation. However, silicon may not be necessarily used, but any material having such properties described above may be applied to (or used to coat) the fifth wrapper 355 without limitation.

[0147] The front end plug 33 may be formed of cellulose acetate. For example, the front end plug 33 may be manufactured by adding a plasticizer (e.g., triacetin) to cellulose acetate tow. The mono denier of a filament constituting the cellulose acetate tow may be in a range of 1.0 to 10.0 and may be desirably in a range of 4.0 to 6.0. The mono denier of the filament of the front end plug 33 may be more desirably 5.0. In addition, a cross-section of the filament constituting the front end plug 33 may be Y-shaped. The total denier of the front end plug 33 may be in a range of 20000 to 30000, and may be desirably in a range of 25000 to 30000. The total denier of the front end plug 33 may be more desirably 28000.

[0148] In addition, as needed, the front end plug 33 may include at least one channel, and a cross-section of the channel may be provided in various shapes.

[0149] The tobacco rod 31 may correspond to the tobacco rod 21 described above with reference to FIG. 11. Thus, a detailed description of the tobacco rod 31 will be omitted here.

[0150] The first segment 321 may be made of cellulose acetate. For example, the first segment may be a tubular structure, including a hollow therein. The first segment 321 may be manufactured by adding a plasticizer (e.g., triacetin) to cellulose acetate tow. For example, the mono denier and the total denier of the first segment 321 may be the same as the mono denier and the total denier of the front end plug 33.

[0151] The second segment 322 may be made of cellulose acetate. A mono denier of a filament of the

second segment 322 may be in a range of 1.0 to 10.0 and may be desirably in a range of 8.0 to 10.0. The mono denier of the filament of the second segment 322 may be more desirably 9.0. In addition, a cross-section of the filament of the second segment 322 may be Y-shaped. The total denier of the second segment 322 may be in a range of 20000 to 30000 and may be desirably about 25000.

[0152] FIG. 13 is a block diagram illustrating an aerosol generating device 900 according to another embodiment.

[0153] The aerosol generating device 900 may include a controller 910, a sensing unit 920, an output unit 930, a battery 940, a heater 950, a user input unit 960, a memory 970, and a communication unit 980. However, the internal structure of the aerosol generating device 900 is not limited to the internal structure illustrated in FIG. 6. It is to be understood by those having ordinary skill in the art to which the disclosure pertains that some of the components shown in FIG. 6 may be omitted or new components may be added according to the design of the aerosol generating device 900.

[0154] The sensing unit 920 may sense a state of the aerosol generating device 900 or a state of an environment around the aerosol generating device 900, and transmit sensing information obtained through the sensing to the controller 910. Based on the sensing information, the controller 910 may control the aerosol generating device 900 to control operations of the heater 950, restrict smoking, determine whether an aerosol generating article (e.g., a cigarette, a cartridge, etc.) is inserted, display a notification, and perform other functions.

[0155] The sensing unit 920 may include at least one of a temperature sensor 922, an insertion detection sensor 924, or a puff sensor 926. However, embodiments are not limited thereto.

[0156] The temperature sensor 922 may sense a temperature at which the heater 950 (or an aerosol generating material) is heated. The aerosol generating device 900 may include a separate temperature sensor for sensing a temperature of the heater 950, or the heater 950 itself may perform a function as a temperature sensor. Alternatively, the temperature sensor 922 may be arranged around the battery 940 to monitor the temperature of the battery 940.

[0157] The insertion detection sensor 924 may sense whether the aerosol generating article is inserted or removed. The insertion detection sensor 924 may include, for example, at least one of a film sensor, a pressure sensor, a light sensor, a resistive sensor, a capacitive sensor, an inductive sensor, or an infrared sensor, which may sense a signal change by the insertion or removal of the aerosol generating article.

[0158] The puff sensor 926 may sense a puff from a user based on various physical changes in an airflow path or airflow channel. For example, the puff sensor 926 may sense the puff of the user based on any one of a temperature change, a flow change, a voltage change, and a

pressure change.

[0159] The sensing unit 9120 may further include at least one of a temperature/humidity sensor, an atmospheric pressure sensor, a magnetic sensor, an acceleration sensor, a gyroscope sensor, a position sensor (e.g., a global positioning system (GPS)), a proximity sensor, or a red, green, blue (RGB) sensor (e.g., an illuminance sensor), in addition to the sensors 922 through 926 described above. In addition, a function of each sensor may be intuitively inferable from its name by one of ordinary skill in the art, and thus, a detailed description thereof will be omitted herein.

[0160] The output unit 930 may output information about the state of the aerosol generating device 900 and provide the information to the user. The output unit 930 may include at least one of a display 932, a haptic portion 934, or a sound outputter 936. However, embodiments are not limited thereto. When the display 932 and a touchpad are provided in a layered structure to form a touchscreen, the display 932 may be used as an input device in addition to an output device.

[0161] The display 932 may visually provide the information about the aerosol generating device 900 to the user. The information about the aerosol generating device 900 may include, for example, a charging/discharging state of the battery 940 of the aerosol generating device 900, a preheating state of the heater 950, an insertion/removal state of the aerosol generating article, a limited usage state (e.g., an abnormal article detected) of the aerosol generating device 900, or the like, and the display 931 may externally output the information. The display 932 may be, for example, a liquid-crystal display (LCD) panel, an organic light-emitting display (OLED) panel, or the like. The display 932 may also be in the form of a light-emitting diode (LED) device.

[0162] The haptic portion 934 may provide the information about the aerosol generating device 900 to the user in a haptic way by converting an electrical signal into a mechanical stimulus or an electrical stimulus. The haptic portion 934 may include, for example, a motor, a piezoelectric element, or an electrical stimulation device.

[0163] The sound outputter 936 may provide the information about the aerosol generating device 900 to the user in an auditory way. For example, the sound outputter 936 may convert an electric signal into a sound signal and externally output the sound signal.

[0164] The battery 940 may supply power to be used to operate the aerosol generating device 900. The battery 940 may supply power to heat the heater 950. In addition, the battery 940 may supply power required for operations of the other components (e.g., the output unit 920, the output unit 930, the user input unit 960, the memory 970, and the communication unit 980) included in the aerosol generating device 900. The battery 940 may be a rechargeable battery or a disposable battery. The battery 940 may be, for example, a lithium polymer (LiPoly) battery, but examples are not limited thereto.

[0165] The heater 950 may receive power from the

battery 940 to heat the aerosol generating material. Although not shown in FIG. 6, the aerosol generating device 900 may further include a power conversion circuit (e.g., a direct current (DC)-to-DC (DC/DC) converter) that converts power of the battery 940 and supplies the power to the heater 950. In addition, when the aerosol generating device 900 generates an aerosol in an induction heating manner, the aerosol generating device 900 may further include a DC-to-alternating current (AC) (DC/AC) converter that converts DC power of the battery 940 into AC power.

[0166] The controller 910, the sensing unit 920, the output unit 930, the user input unit 960, the memory 970, and the communication unit 980 may receive power from the battery 940 to perform functions. Although not shown in FIG. 6, the aerosol generating device 900 may further include a power conversion circuit, for example, a low dropout (LDO) circuit or a voltage regulator circuit, which converts power of the battery 940 and supplies the power to respective components.

[0167] In an embodiment, the heater 950 may be formed of a suitable predetermined electrically resistive material. For example, the electrically resistive material may be a metal or a metal alloy including, for example, titanium, zirconium, tantalum, platinum, nickel, cobalt, chromium, hafnium, niobium, molybdenum, tungsten, tin, gallium, manganese, iron, copper, stainless steel, nichrome, or the like. However, embodiments are not limited thereto. In addition, the heater 130 may be implemented as a metal heating wire, a metal heating plate on which an electrically conductive track is arranged, a ceramic heating element, or the like. However, embodiments are not limited thereto.

[0168] In another embodiment, the heater 950 may be an induction heater. For example, the heater 950 may include a susceptor that heats an aerosol generating material by generating heat through a magnetic field applied by a coil.

[0169] The user input unit 960 may receive information input from a user or may output information to the user. For example, the user input unit 960 may include a keypad, a dome switch, a touchpad (e.g., a contact capacitive type, a pressure resistive film type, an infrared sensing type, a surface ultrasonic conduction type, an integral tension measurement type, a piezo effect method, etc.), a jog wheel, a jog switch, or the like, but is not limited thereto. In addition, although not shown in FIG. 6, the aerosol generating device 900 may further include a connection interface, such as a USB interface, and may be connected to another external device through the connection interface, such as a USB interface, to transmit and receive information or to charge the battery 940.

[0170] The memory 970, which is hardware for storing various pieces of data processed in the aerosol generating device 900, may store data processed by the controller 910 and data to be processed thereby. The memory 970 may include at least one type of storage medium

of a flash memory type memory, a hard disk type memory, a multimedia card micro type memory, a card type memory (e.g., an SD or XE memory), a random access memory (RAM), a static RAM (SRAM), a read-only memory (ROM), an electrically erasable programmable ROM (EEPROM), a programmable ROM (PROM), a magnetic memory, a magnetic disk, or an optical disk. The memory 970 may store an operating time of the aerosol generating device 900, a maximum number of puffs, a current number of puffs, at least one temperature profile, data associated with a smoking pattern of the user, or the like.

[0171] The communication unit 980 may include at least one component to communicate with another electronic device. For example, the communication unit 980 may include a short-range wireless communication unit 982 and a wireless communication unit 984.

[0172] The short-range wireless communication unit 982 may include a Bluetooth communication unit, a Bluetooth low energy (BLE) communication unit, a near field communication unit, a WLAN (Wi-Fi) communication unit, a ZigBee communication unit, an infrared data association (IrDA) communication unit, a Wi-Fi direct (WFD) communication unit, an ultra-wideband (UWB) communication unit, and an Ant+ communication unit.

However, embodiments are not limited thereto.

[0173] The wireless communication unit 984 may include, for example, a cellular network communicator, an Internet communicator, a computer network (e.g., a local area network (LAN) or a wide-area network (WAN)) communicator, or the like. However, embodiments are not limited thereto. The wireless communication unit 984 may use subscriber information (e.g., international mobile subscriber identity (IMSI)) to identify and authenticate the aerosol generating device 900 in a communication network.

[0174] The controller 910 may control the overall operation of the aerosol generating device 900. In an embodiment, the controller 910 may include at least one processor. The processor may be implemented as an array of a plurality of logic gates or may be implemented as a combination of a general-purpose microprocessor and a memory in which a program executable by the microprocessor is stored. In addition, it is to be understood by one of ordinary skill in the art to which the present disclosure pertains that it may be implemented in other types of hardware.

[0175] The controller 910 may control the temperature of the heater 950 by controlling the supply of power from the battery 940 to the heater 950. For example, the controller 910 may control the supply of power by controlling the switching of a switch element between the battery 940 and the heater 950. In another example, a direct heating circuit may control the supply of power to the heater 950 according to a control command from the controller 910.

[0176] The controller 910 may analyze a sensing result obtained by the sensing of the sensing unit 920 and control processes to be performed thereafter. For exam-

ple, the controller 910 may control power to be supplied to the heater 950 to start or end an operation of the heater 950 based on the sensing result obtained by the sensing unit 920. In another example, the controller 910 may control an amount of power to be supplied to the heater 950 and a time for which the power is to be supplied, such that the heater 950 may be heated up to a predetermined temperature or maintained at a desired temperature, based on the sensing result obtained by the sensing unit 920.

[0177] The controller 910 may control the output unit 930 based on the sensing result obtained by the sensing unit 920. For example, when a number of puffs counted through the puff sensor 926 reaches a preset number, the controller 910 may inform the user that the aerosol generating device 900 is to be ended soon, through at least one of the display 932, the haptic portion 934, or the sound outputter 936.

[0178] According to an embodiment, the controller 910 may control a power supply time and/or a power supply amount for the heater 950 according to a state of the aerosol generating article sensed by the sensing unit 920. For example, when an aerosol generating article 15 is in an over-humidified state, the controller 910 may control the power supply time for an inductive coil (e.g., an inductive coil 124 of FIG. 2) to increase a preheating time, compared to a case where the aerosol generating article 15 is in a general state.

[0179] One embodiment may also be implemented in the form of a recording medium including instructions executable by a computer, such as a program module executable by the computer. A computer-readable medium may be any available medium that can be accessed by a computer and includes all of a volatile medium, a non-volatile medium, a removable medium, and a non-removable medium. In addition, the computer-readable medium may include both a computer storage medium and a communication medium. The computer storage medium includes all of a volatile medium, a non-volatile medium, a removable medium, and a non-removable medium implemented by any method or technology for storage of information such as computer-readable instructions, data structures, program modules or other data. The communication medium typically includes computer-readable instructions, data structures, other data in modulated data signals such as program modules, or other transmission mechanisms, and includes any information transfer medium.

[0180] As described above, the embodiment has been described with reference to specific matters such as specific components and limited embodiments and drawings, but these are provided to help the overall understanding. Also, the present disclosure is not limited to the above-described embodiments, and various modifications and variations are possible from these descriptions by those skilled in the art to which the present disclosure pertains. Accordingly, the scope of the present disclosure is defined not by the detailed description, but by the

claims and their equivalents, and all variations within the scope of the claims and their equivalents are to be construed as being included in the disclosure.

Claims

1. An aerosol generating device comprising:

a supplier comprising an aerosol forming substrate;
a substrate unit configured to atomize the aerosol forming substrate;
a surface wave generator configured to transmit a surface acoustic wave that atomizes the aerosol forming substrate to the substrate unit; and
an inhaler from which a user inhales the aerosol forming substrate atomized in the substrate unit, wherein the supplier is configured to move the aerosol forming substrate to the substrate unit.

2. The aerosol generating device of claim 1, wherein the supplier comprises:

a storage element configured to store the aerosol forming substrate; and
a channel element connected to the storage element and configured to move the aerosol forming substrate stored in the storage element.

3. The aerosol generating device of claim 2, wherein

the aerosol forming substrate comprises different types of a plurality of liquids, and
the supplier comprises:
a first storage element configured to store a first liquid and a second storage element configured to store a second liquid.

4. The aerosol generating device of claim 2, wherein the channel element is configured to move the aerosol forming substrate through a capillary phenomenon.

5. The aerosol generating device of claim 2 or 4, wherein the supplier further comprises:
a control element configured to control a rate of flow of the aerosol forming substrate that moves through the channel element.

6. The aerosol generating device of claim 3, wherein the supplier comprises:
a first channel element configured to move the first liquid stored in the first storage element and a second channel element configured to move the second liquid stored in the second storage.

7. The aerosol generating device of claim 6, wherein the supplier further comprises:
a third storage element connected to the first channel element and the second channel element and configured to mix the first liquid with the second liquid and a third channel element configured to move the mixed first liquid and the mixed second liquid from the third storage element to the substrate unit. 5

8. The aerosol generating device of claim 1, wherein the surface wave generator comprises:
a plurality of surface wave generating elements configured to generate a surface acoustic wave independently of one another. 10
15

9. The aerosol generating device of claim 6, wherein the supplier further comprises:
a first control element configured to control a rate of flow of the first liquid that moves and a second control element configured to control a rate of flow of the second liquid that moves. 20

10. The aerosol generating device of claim 6 or 9, wherein the substrate unit further comprises: 25

a first substrate configured to atomize the first liquid and a second substrate configured to atomize the second liquid; and
a reactor in which the atomized first liquid and the atomized second liquid react. 30

11. The aerosol generating device of claim 10, wherein the surface wave generator comprises:
a first surface wave generating element configured to transmit a surface acoustic wave to the first substrate and a second surface wave generating element configured to transmit a surface acoustic wave to the second substrate. 35
40

12. The aerosol generating device of claim 7, wherein the surface wave generator comprises:
a first surface wave generating element configured to transmit a surface acoustic wave to the substrate unit and a second surface wave generating element configured to transmit a surface acoustic wave to the third storage element. 45

13. The aerosol generating device of claim 4, wherein the channel element comprises a porous structure. 50

55

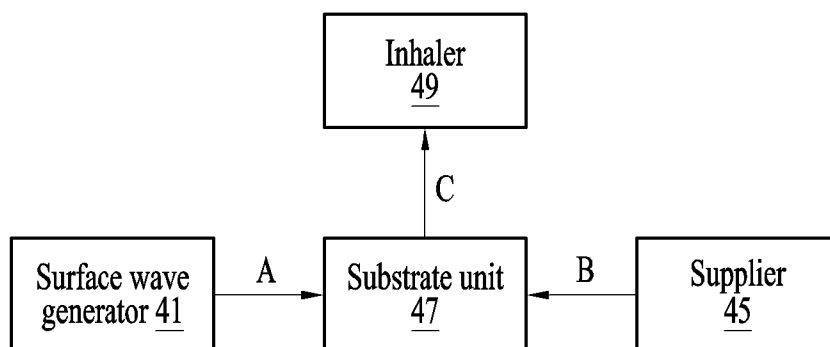


FIG. 1

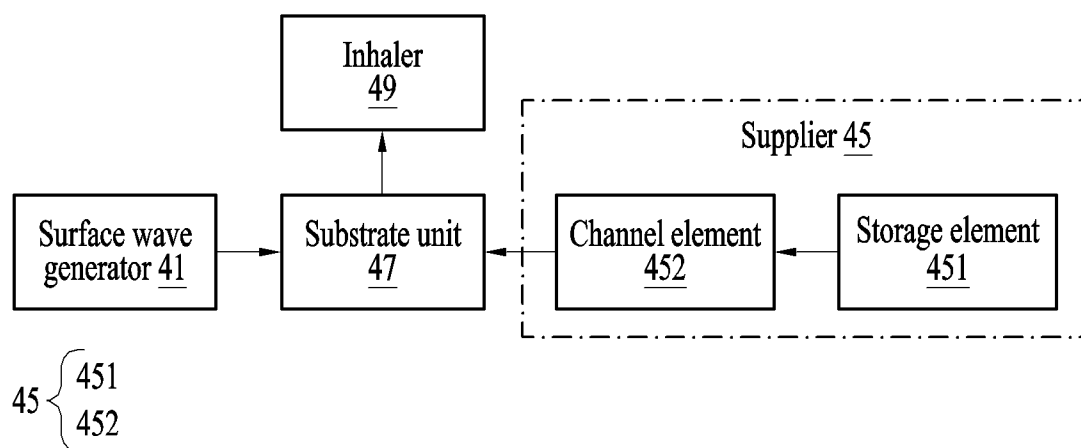


FIG. 2

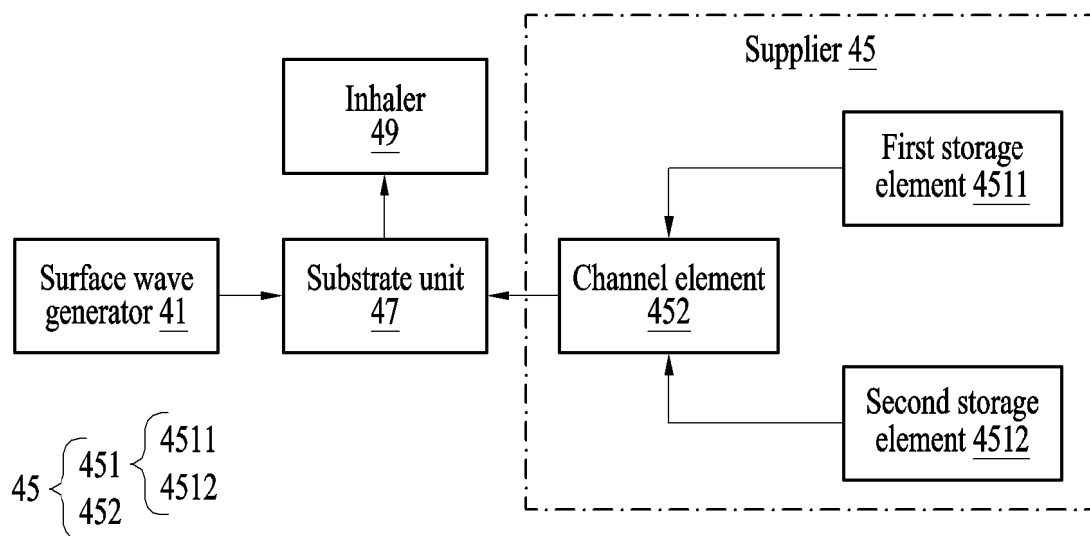


FIG. 3

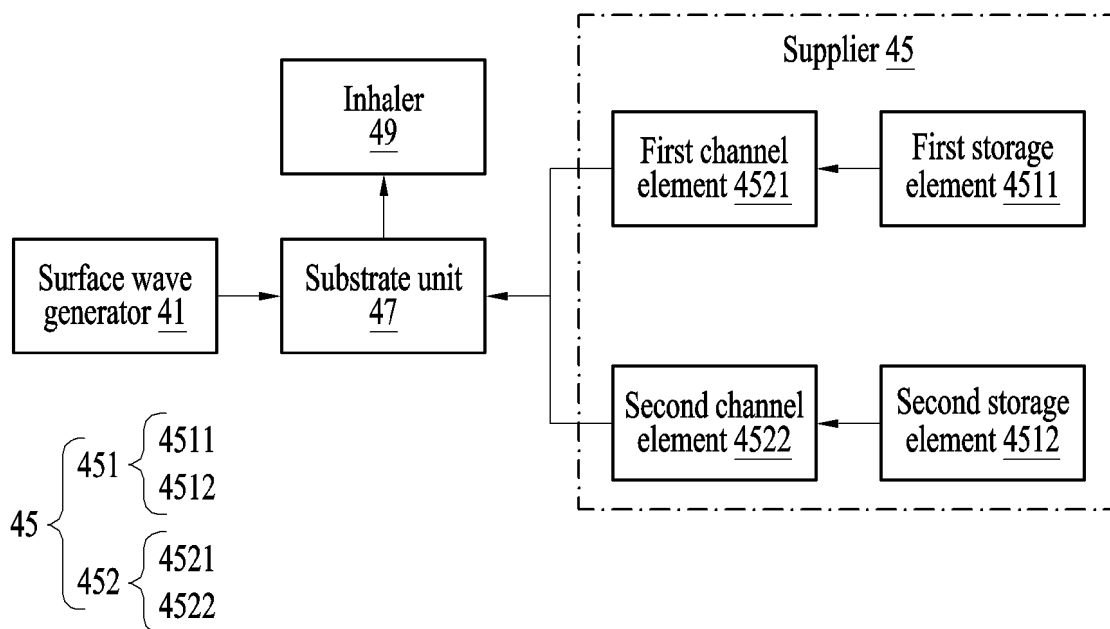


FIG. 4

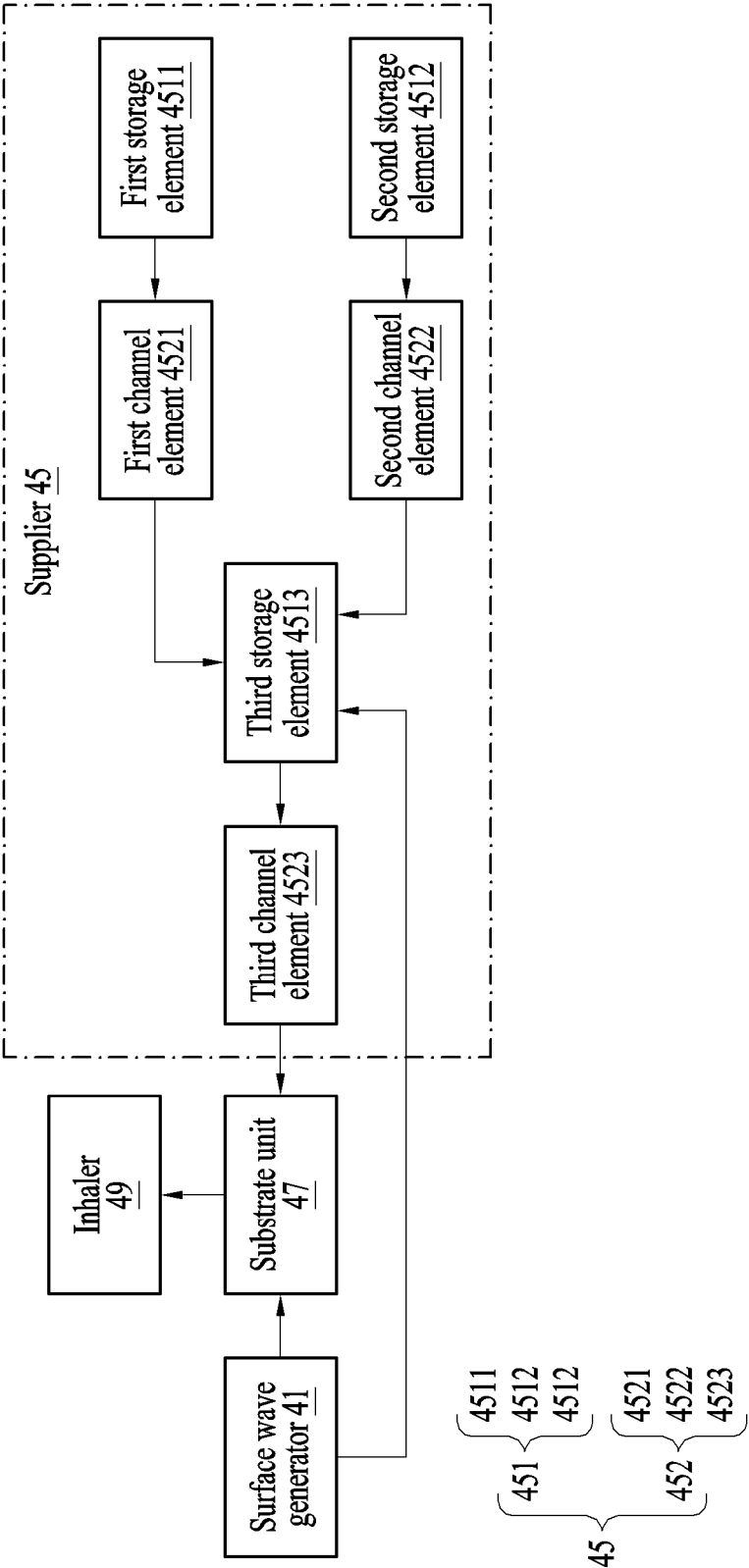


FIG. 5A

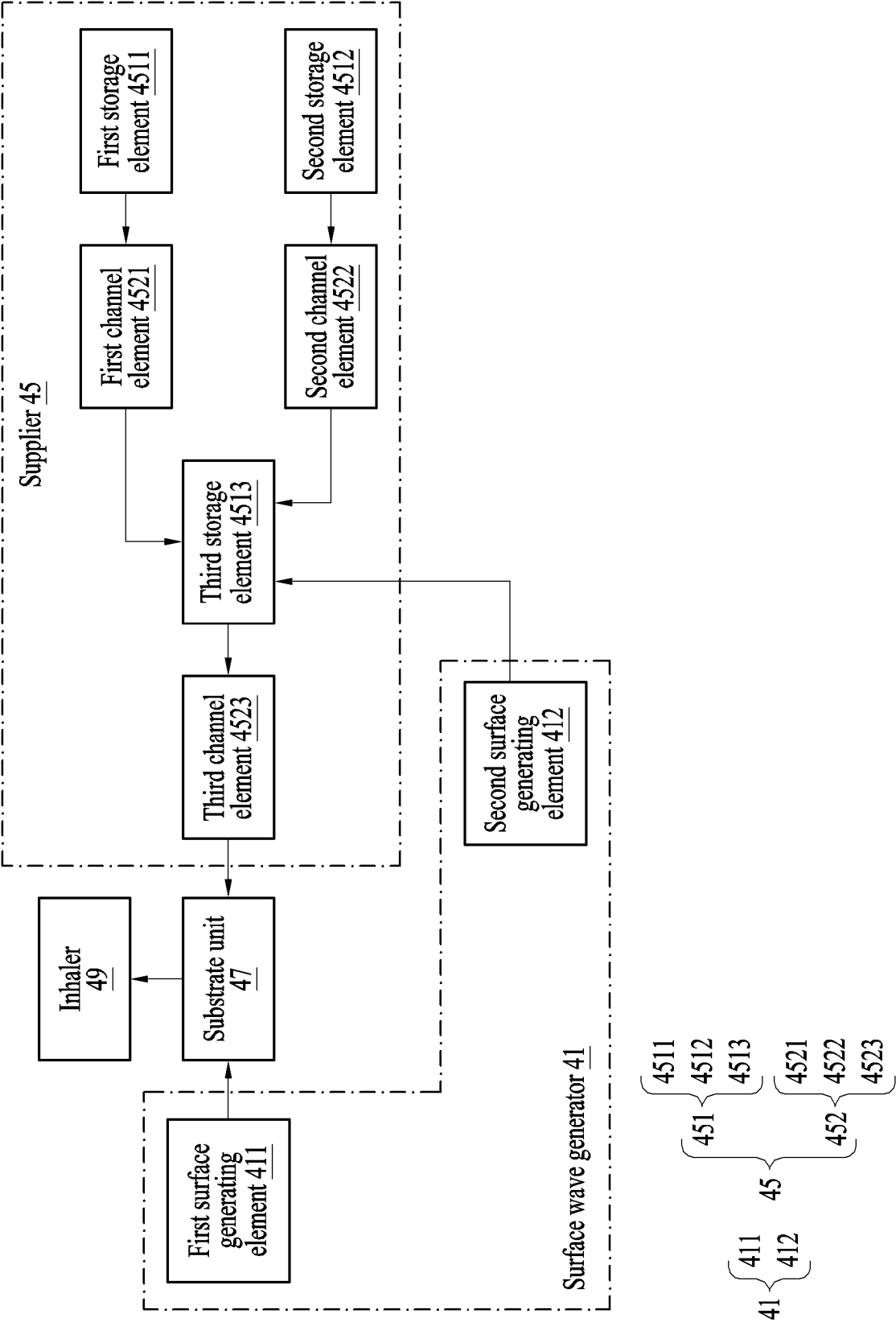


FIG. 5B

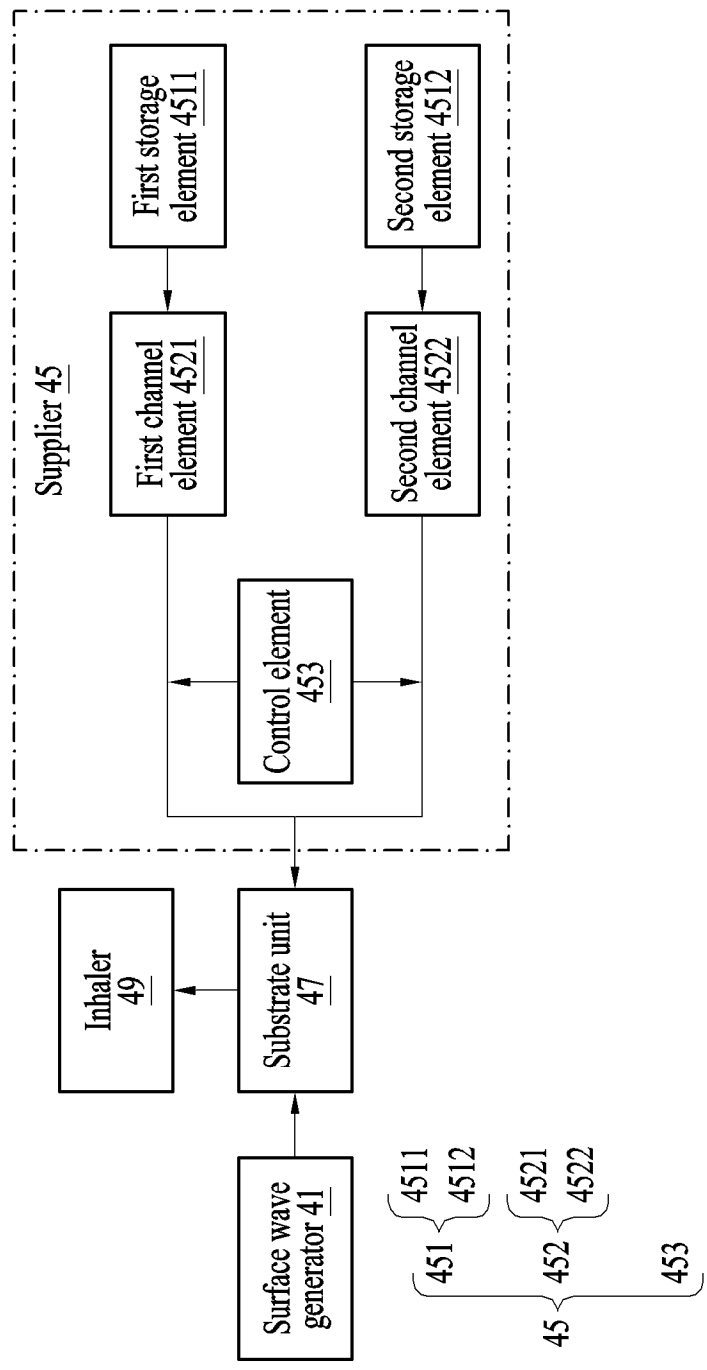


FIG. 6A

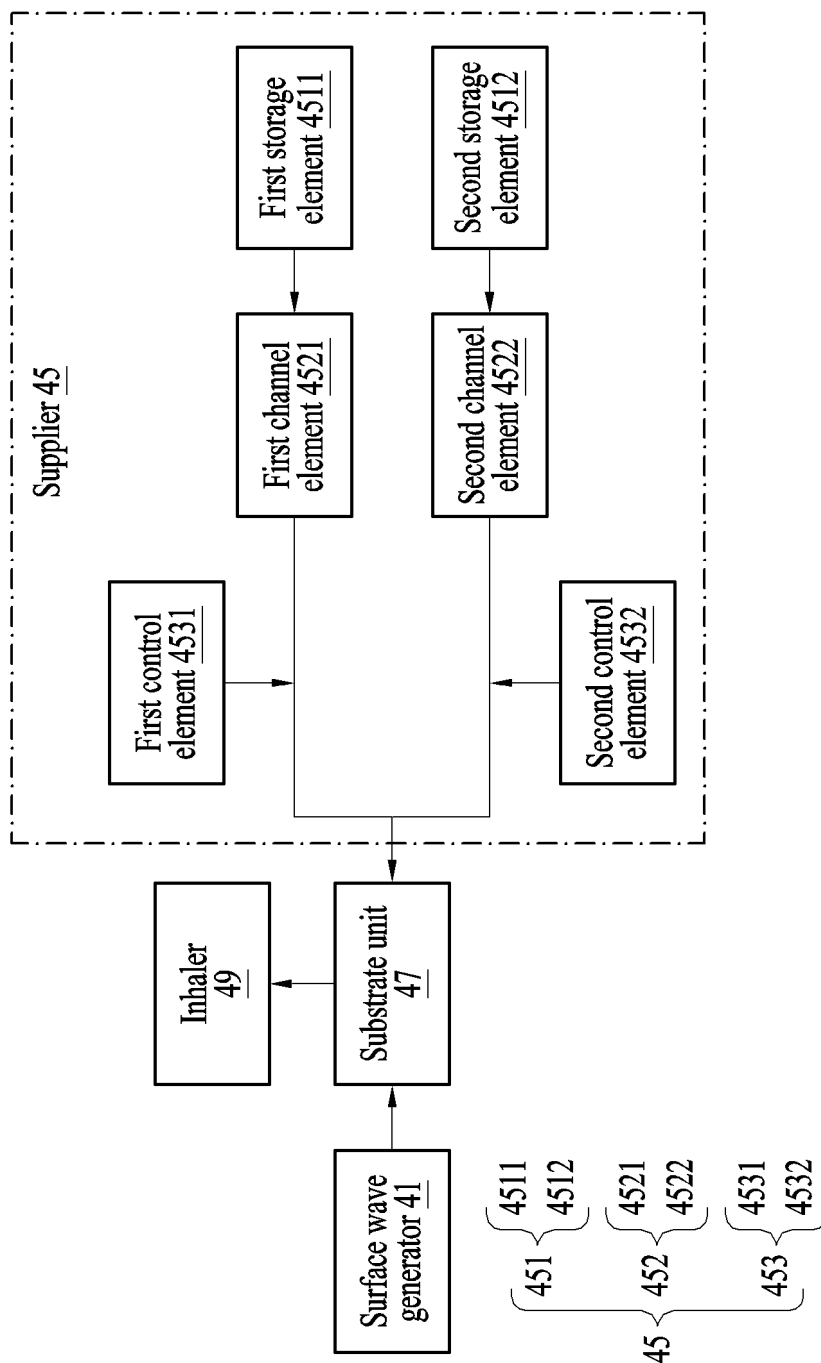


FIG. 6B

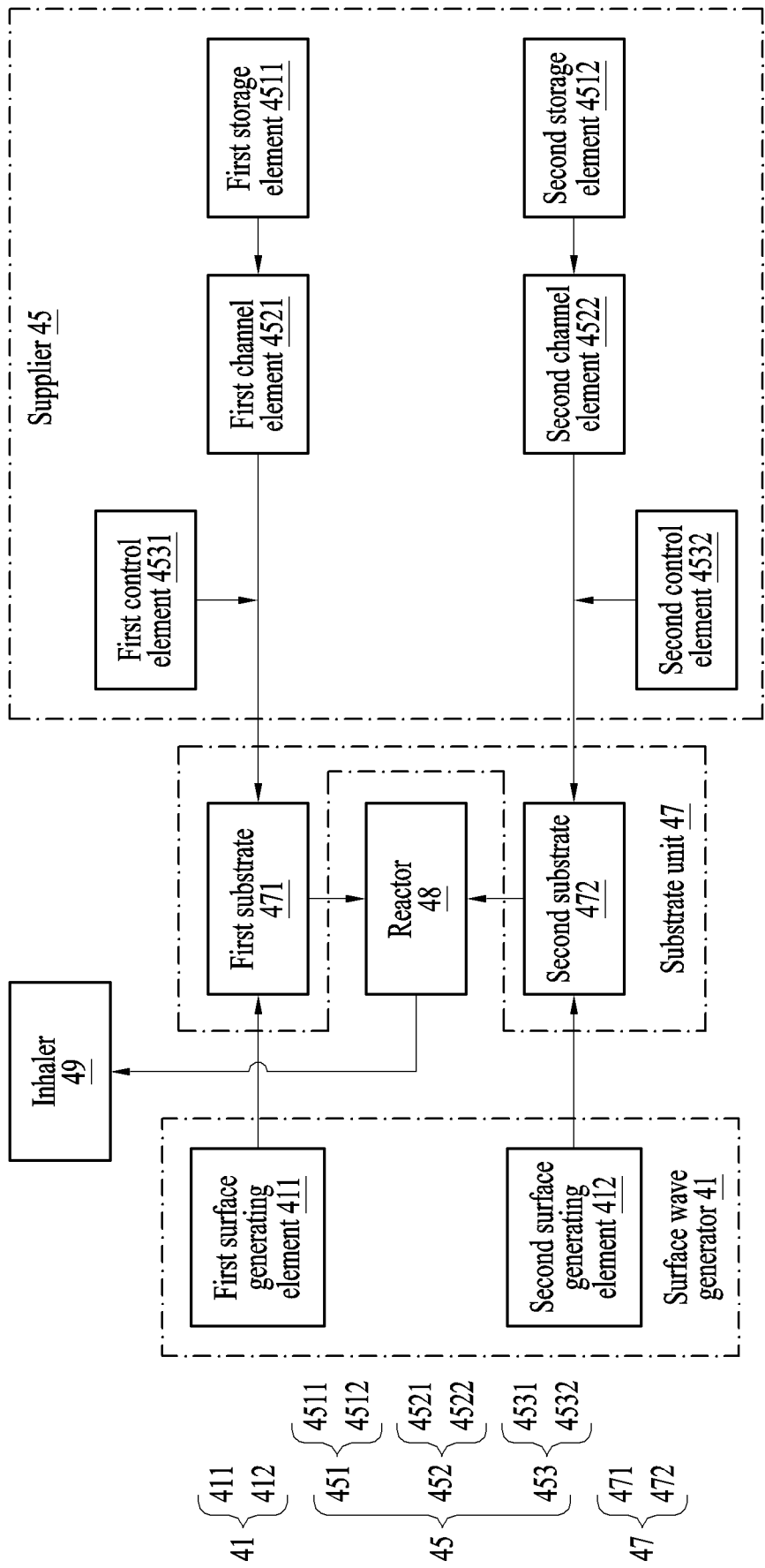


FIG. 7

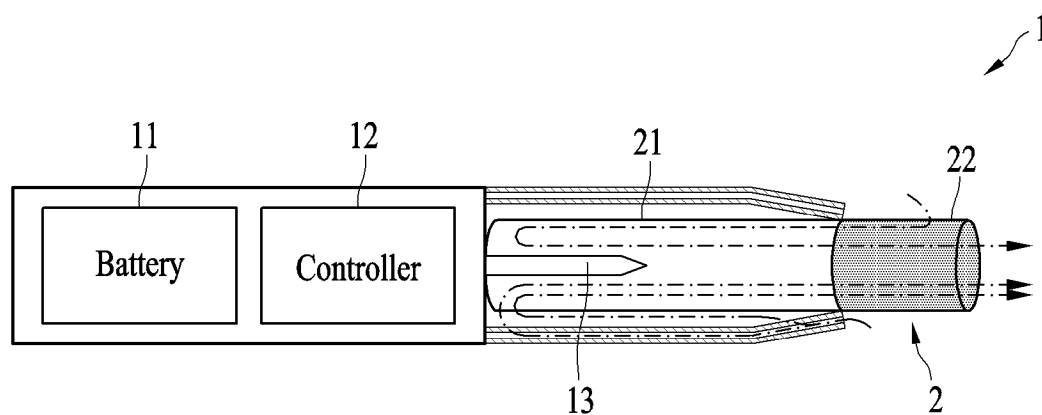


FIG. 8

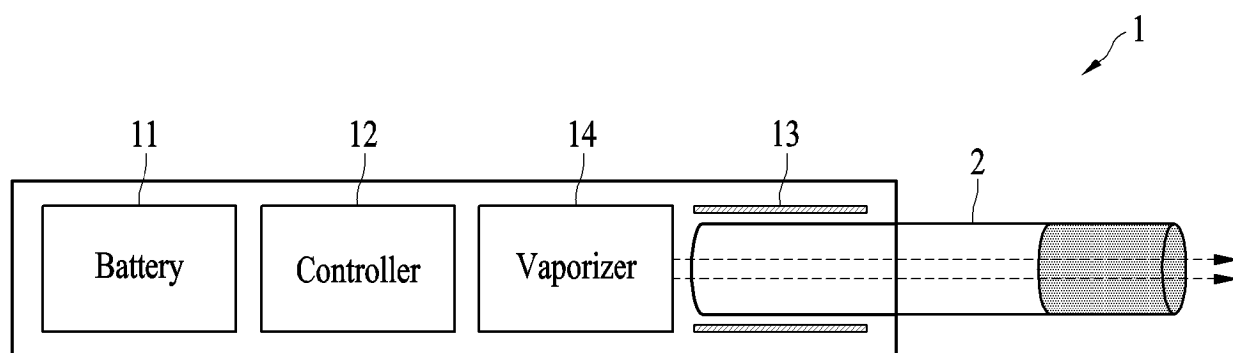


FIG. 9

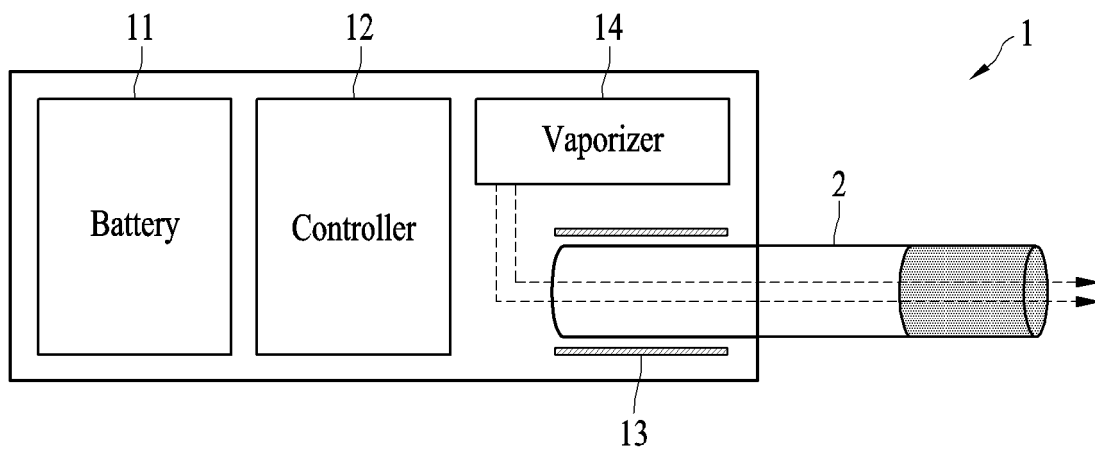


FIG. 10

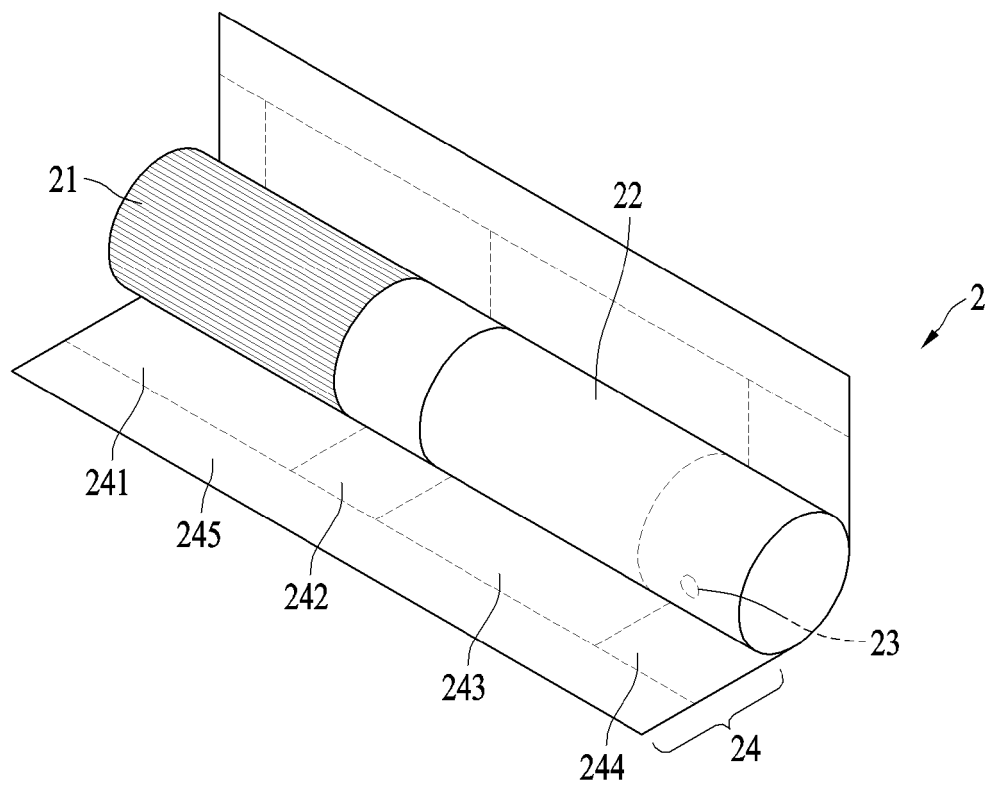


FIG. 11

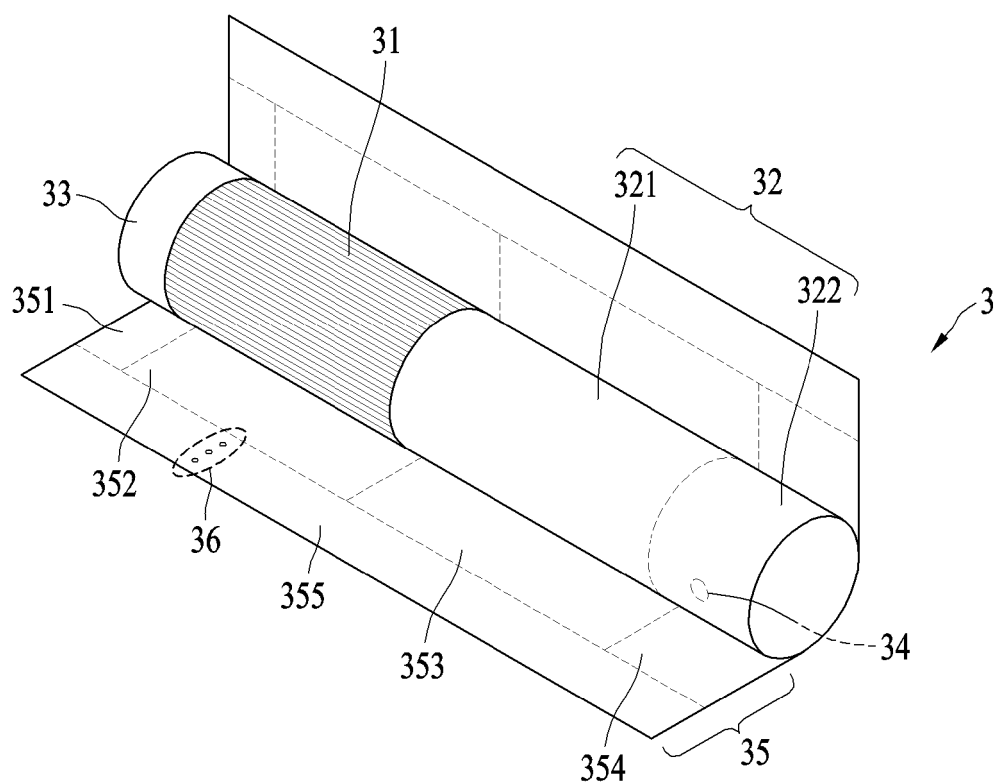


FIG. 12

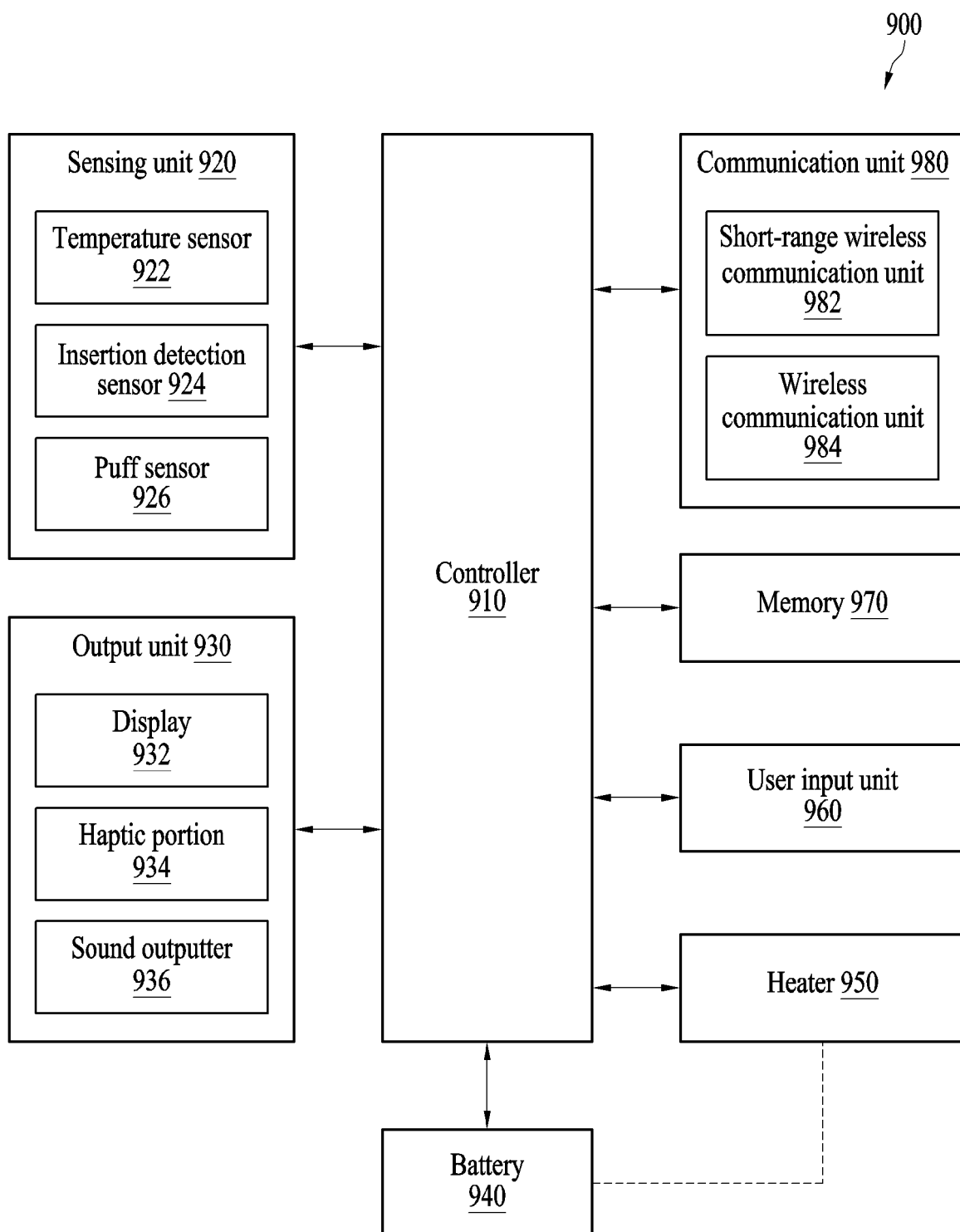


FIG. 13

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2023/007661

A. CLASSIFICATION OF SUBJECT MATTER

A24F 40/05(2020.01)i; A24F 40/30(2020.01)i; A24F 40/10(2020.01)i; A24F 40/42(2020.01)i; A24F 40/44(2020.01)i;
A24F 40/50(2020.01)i; A24F 40/485(2020.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24F 40/05(2020.01); A24F 40/10(2020.01); A24F 40/57(2020.01); B05B 15/52(2018.01); B05B 17/06(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models: IPC as above

Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords: 에어로졸(aerosol), 표면 탄성파(surface acoustic wave), 기판(substrate), 모세관
(capillary) 및 혼합(mixture)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-2022-0119436 A (PHILIP MORRIS PRODUCTS S.A.) 29 August 2022 (2022-08-29) See paragraphs [0015]-[0092] and [0102]-[0124] and figures 1-6.	1-9,13
Y		10-12
Y	US 2022-0022551 A1 (JAPAN TOBACCO INC.) 27 January 2022 (2022-01-27) See paragraphs [0022] and [0056]-[0057] and figures 1-2.	10,11
Y	KR 10-2441793 B1 (OH, Seong Min) 08 September 2022 (2022-09-08) See paragraph [0065] and figure 1.	12
X	US 2021-0076734 A1 (JAPAN TOBACCO INC.) 18 March 2021 (2021-03-18) See paragraphs [0178]-[0228], [0301], [0382]-[0391], [0513] and [0582] and figures 1-6, 28, 39-41 and 49-53.	1-6,13
X	KR 10-2022-0119440 A (PHILIP MORRIS PRODUCTS S.A.) 29 August 2022 (2022-08-29) See paragraphs [0125]-[0143] and figures 1-8.	1,2,4,5,8,13

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“D” document cited by the applicant in the international application

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

04 September 2023

Date of mailing of the international search report

04 September 2023

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208

Facsimile No. +82-42-481-8578

Authorized officer

Telephone No.

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2023/007661

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
KR 10-2022-0119436 A	29 August 2022	CN 114845760 A	02 August 2022
		EP 4081283 A1	02 November 2022
		JP 2023-508889 A	06 March 2023
		US 2023-0088017 A1	23 March 2023
		WO 2021-130220 A1	01 July 2021
US 2022-0022551 A1	27 January 2022	CN 113677384 A	19 November 2021
		EP 3954414 A1	16 February 2022
		JP 7194266 B2	21 December 2022
		WO 2020-209112 A1	15 October 2020
KR 10-2441793 B1	08 September 2022	None	
US 2021-0076734 A1	18 March 2021	CA 3096355 A1	17 October 2019
		CA 3096937 A1	17 October 2019
		CA 3097177 A1	17 October 2019
		CA 3097177 C	20 June 2023
		CA 3097416 A1	17 October 2019
		CN 112261882 A	22 January 2021
		CN 112272523 A	26 January 2021
		CN 112714677 A	27 April 2021
		CN 112714677 B	10 January 2023
		CN 112912181 A	04 June 2021
		CN 112912181 B	16 June 2023
		EP 3777583 A1	17 February 2021
		EP 3777584 A1	17 February 2021
		EP 3778036 A1	17 February 2021
		EP 3778038 A1	17 February 2021
		US 2021-0022391 A1	28 January 2021
		US 2021-0022406 A1	28 January 2021
		US 2021-0030069 A1	04 February 2021
		WO 2019-198162 A1	17 October 2019
		WO 2019-198275 A1	17 October 2019
		WO 2019-198684 A1	17 October 2019
		WO 2019-198686 A1	17 October 2019
		WO 2019-198687 A1	17 October 2019
		WO 2019-198688 A1	17 October 2019
KR 10-2022-0119440 A	29 August 2022	CN 114845581 A	02 August 2022
		EP 4081057 A1	02 November 2022
		JP 2023-507035 A	20 February 2023
		WO 2021-129986 A1	01 July 2021

Form PCT/ISA/210 (patent family annex) (July 2022)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0017578 A [0003]